NAVSWC TR 91-13

STRATEGIC ADVANTAGE IN THE 1990s:
TOTAL QUALITY MANAGEMENT ENABLED BY INFORMATION TECHNOLOGY

BY DAVID C. GARDINER
ENGINEERING AND INFORMATION SYSTEMS DEPARTMENT

JANUARY 1991

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NAVAL SURFACE WARFARE CENTER
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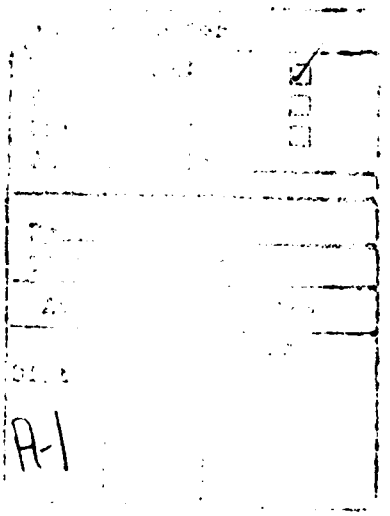

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FOREWORD

Entering the 1990s, Federal Government and private industry organizations are facing new and increasingly complex management challenges. Growth and even survival in this decade will require organizations to effect fundamental and major transformation (e.g., streamlining and restructuring). The leadership and the entire work force of the Naval Surface Warfare Center (NAVSWC) must be prepared to meet these challenges in a way that will ensure our future. The Center's adoption of a Total Quality Management (TQM) philosophy will enhance continued improvement of our reputation for excellence. This report shows how Information Technology (IT) provides essential support to our TQM way of doing business.

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Approved by:

R. T. RYLAND, JR., Head
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SECTION 1
INTRODUCTION

The Naval Surface Warfare Center (NAVSWC) is introducing Total Quality Management (TQM) as its basic management approach. TQM will enable the Center to continually improve on its reputation of excellence and will prepare us to respond to the inevitable changing roles in the Department of Defense (DOD).

PURPOSE

This report provides concepts and techniques to support the Center's TQM implementation. The main objective is to show that *Information Technology (IT) is an essential enabler of TQM*. The following are addressed:

- *Why* the Center is implementing TQM—to give *purpose* for this considerable investment in the future and provide *insight* into what the approach should consider.

- At least conceptually, *how* the Center might implement TQM—to provide recommendations for a corporate and strategic management approach.

WHY TQM

Business in the 1990s will *not* be business as usual, as it was in the 1980s. The Center will most likely not have the amount of funding or the spending flexibility it enjoyed in the past decade; it will also experience some decrease in management autonomy.

Universally, the 1990s will experience significant political, sociological, and economic change. Survival and growth in this decade will require organizations to effect fundamental and major transformation. Organizations must achieve a *strategic advantage* relative to other organizations; i.e., not only doing things better, but doing new and better things. These rather profound statements come from the conclusions of the landmark research project, *Management in the 1990s*, that was conducted by the Sloan School of Management. Government and commercial organizations will be said to have achieved a strategic advantage when they exhibit the following attributes:

- Information-Based
- Fast Responding
- Streamlined Processes
- Capable of Taking Risks
- Strategic Alliance with Customers and Suppliers
- Shared Corporate Values
- Adaptive
- Cost Effective

The bottom line to why NAVSWC should implement TQM and the main thesis of this paper follows: **TQM enabled by the effective management of IT is the long-term, permanent solution for achieving a strategic advantage.**

HOW TO IMPLEMENT TQM

In order for TQM to achieve its optimum benefits, it should follow a *corporate* and *strategic management* approach. Corporately, the TQM approach should view the Center as a *system* that ensures that all its parts (i.e., its people, organizations, and processes) work toward a common aim and framework. A strategic management approach would include both business and performance (quality) planning and execution. Strategic Business Planning is driven by Navy needs and political, military, social, and economic scenarios. Strategic Performance Planning is driven by mission objectives that are developed during Business Planning and is based on an understanding of customer requirements and internal business process capabilities.

IT supports this corporate and strategic management approach in many ways; the most obvious is the support provided by measurement and communication systems. **However, the greatest impact of IT on TQM is the framework that IT provides for determining what needs improving and the analytical tools to actually improve our processes.** NAVSWC's Information Architecture provides the corporate- and strategic-level framework for management to choose what to improve and an insight into the process and organizational transformations that would result. IT methods (e.g., data and process modeling) will aid managers and Process Action Teams (PATs) to develop improved processes that fit into the corporate *systems* framework. **The Information Architecture models will help prevent individual departments from working on the wrong things or in a way that duplicates and/or conflicts with the corporate direction.**

The product (Information Architecture) and service (modeling) capabilities of the Systems Division's (E50) NAVSWC Information Command and Control System (NICCS) Program is a valuable resource for the Center's TQM implementation. This paper addresses these resources and provides other concepts and techniques from respected experts (e.g., Deming, Drucker, and Sink). It is hoped that the suggestions made herein will aid management in the development of a corporate and strategic management TQM approach.

REPORT OUTLINE

This report addresses the following areas:

- **Challenges**—Briefly addresses some of the challenges that the Center must face now and in the future.
- **Current Situation**—Reviews weaknesses found in Government and private industry organizations in an effort to help focus our improvement efforts.
- **Transformation**—Relates Sloan School studies in organizational transformation so that we might strategically drive the desired changes.
- **TQM Enabled by IT**—IT provides essential support to TQM implementation.
- **Strategic Management -- A Corporate TQM Approach**—Recommends a Strategic Management Model for developing a corporate TQM approach.
- **Appendix**—Provides a collection of strategic concepts and practical techniques for organizational transformation and process improvement.

SECTION 2
CHALLENGES

A global economy, rapidly advancing and increasingly complex technology, more demanding and enlightened customers and employees, dynamic internal and external environments, as well as increasing uncertainty and risk are just a few of the factors that have combined to cause the task of leading and managing to be ever more complex and challenging.[1]

NATIONAL CHALLENGE

Federal managers have challenges that span both nationally and within their respective organizations. Nationally, we must be concerned about our country's declining economic position. *Let us think about the U.S. or about all North America, not just about ourselves, nor just about our company, nor about our own community. How is the U.S. doing in respect to balance of trade? The answer is that we are not doing well...we have been on an economic decline for three decades.*[2] This decline has resulted in lower tax revenues while Government spending has increased; thus, a larger national debt has resulted. We are faced with the prospect that higher taxes, interest rates, and inflation will cause a lower standard of living and quality of life. The challenge becomes a personal one! How do we help turn this around? One way that is within our scope of control is to **work with our suppliers to improve the quality of products to our internal and external customers.** This helps the economy and improves our program's quality and productivity. **The challenge is to turn our concerns for the Nation's well being into innovative ways to improve it.**

DOD AND NAVY CHALLENGES

Internally, we are facing challenges that will result from DOD restructuring and the inevitable DOD- and Navy-directed budget cuts.

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[1]Sink, D. S. and T. C. Tuttle, *Planning and Measurement in Your Organization of the Future*, Industrial Engineering and Management Press, 1989.

[2]Deming, W. E., *Foundation for Management of Quality in the Western World*, Quality Enhancement Seminars, 1990.

DOD Consolidations

Defense Management Review (DMR) 922 requires the Services to study alternatives for achieving increased effectiveness and efficiencies through consolidation of R&D and Engineering organizations. Currently, a leading Navy alternative is to consolidate roughly 34 Navy activities into four *Warfare Centers* that would report to the various Systems Commands. NAVSWC would become a Naval Sea Systems Command (NAVSEASYSCOM) activity. The Systems Commands are developing implementation plans that will be presented to the Secretary of the Navy (SECNAV) in April 1991. The other Services (i.e., Army and Air Force) are also developing consolidation plans. If the alternatives presented by the Services are not acceptable to DOD, the possibility exists that *Purple Suit* consolidated organizations will be formed under the Office of Secretary of Defense (OSD) management structure. Needless to say, the ramifications of these considerations will change the way we do business. **The challenge for NAVSWC is to be strategically positioned relative to other activities; i.e., to have a strong technical base and management processes that are adaptive, flexible, responsive, cost effective, etc.**

Other DMRs that could impact Center management processes are DOD consolidations of functional activities such as automated data processing (ADP), financial management, personnel, supply, public works, etc.

Budget Reductions

Besides the uncertainties surrounding the management chain-of-command restructuring of DMR 922, the principal driver of this initiative is to save money. The target for the Navy is a savings of $1.1B over 5 yr. One scenario that is being considered by Headquarters is to cut the overhead budget by 3 percent in FY91, 6 percent in FY92, 9 percent in FY93, 12 percent in FY94, and 15 percent in FY95 and outyears.

DMR 919, *Efficiency and Economy*, will also impact the Center's overhead budget. SPAWAR has already included a 2-percent cut in overhead in the FY92 budget and a 4-percent cut in FY93 and outyears.

DMR 925, *ADP*, addresses cuts in ADP expenditures Navy-wide of $9M in FY91, $13M in FY92, and $24M in FY93. Additionally, DMR 925 will most likely lower the in-house approval thresholds for systems acquisition, development, and operations. At least temporarily, DOD Corporate Information Management (CIM) has zeroed all IT development budgets in 1991.

In addition to these DMR cuts, the Center may be required to absorb overhead cuts of roughly 10 percent due to military costs, FICA (Employee Compensation), and other overhead subsidies. The impact of any one of the overhead initiatives is uncertain but collectively, the overall reduction will require more than *smoke and mirrors* to achieve.

The challenge is to resist making short-term decisions to cut overhead initiatives that are investments for our future.

CHALLENGES BOTTOM LINE

To summarize, we need to ask: *Is NAVSWC strategically poised to compete for and operate as the lead R&D lab in the DOD consolidations?* Additional questions that should be pondered—not just to arrive at an affirmative to the strategic position question, but to give insight into the strategic issues before us—follow:

- Can we quickly and confidently respond to external data calls and to internal decisions?
- Can we respond to internally or externally directed changes in our automated fiduciary systems in a timely manner (in days rather than weeks or months)?
- Can a 10- to 25-percent overhead reduction be made without seriously impacting support to direct programs?
- Can personnel cuts be made without cutting direct programs?
- Can we make overhead reduction decisions without reducing or eliminating our investments in the future?

SECTION 3
CURRENT SITUATION

An initial step in the improvement process is to determine those areas that need attention. Sometimes it is difficult to critically review our own organizations because of (1) our paradigms that have been firmly established over the years and (2) the pride associated with our accomplishments. Thus, this section will relate a list of common concerns found in industry and Government. An example of an ineffective industry process will be presented to help us start looking at some of our business processes that may have similar concerns.

COMMON CONCERNS

A list of common concerns found in industry and Government follows:

- U. S. Industry Quality Behind Foreign Competition
- Not Sensitive to Customer Needs
- Labor Force Productivity Less Than 65 Percent
- Many Layers of Organizational Hierarchy
- Cumbersome Business Processes
- Overhead Portion of Budget Too High
- Data Rich--Information Poor
- High O&M Information Systems Cost
- Slow to Adapt to Change

ORGANIZATIONAL AND BUSINESS PROCESSES EXAMPLE

The Federal Government, especially industrially funded activities, faces many of the same business processing problems as does private industry. However, there are more opportunities to learn from private industry because it has been driven to

improve earlier than has the Federal Government in order to survive the competition. The example that follows shows an attempt by a traditional industry organization to respond to a price change by its competitors. NAVSWC is not faced with this exact situation; however, we do get numerous and, often times, unexpected requests for information. The Competitive Price Move example[3] (Figure 1) addresses the following common business organizational and process concerns:

- Many Layers of Organizations Hierarchy
- Cumbersome Business Processes
- Data Rich—Information Poor
- Slow to Adapt to Change

Figure 1 shows that the information flows up, down, and across many organizational units in response to a competitor's price change. The organizational structure itself obstructs the information flow. Not only must data be assembled and analyzed, but decisions must be made. This information gathering and decision-making process is conducted by different organizations (e.g., production, engineering, marketing, accounting, inventory, and sales). Engineers, analysts, and managers—many of whom are not close to the problems—must contribute to the solution.

Besides the obvious time delays and the additional effort required when work is fragmented across many people and organizations, a potentially more serious concern is the accuracy and consistency of the data used to make the decisions. Figure 2 shows how a typical organization processes and maintains its data in different places and in different ways. Often times, it is either too difficult or impossible to reconcile the different data sources, which results in decisions being made on intuition rather than on facts.

INDUSTRY SITUATION

The current recession and increased competition is causing many companies to restructure their organization and streamline their processes: IBM is planning to reduce by 35,000 employees and DEC by 6000; Peat Marweik will release 300 partners. A leading electronic company expects to reduce its purchasing staff of 3000

[3]Curtice, R. M., *Streamlining the Corporation of the 90s: Toward the Information-Based Organization*, Database Newsletter, July/August 1990.

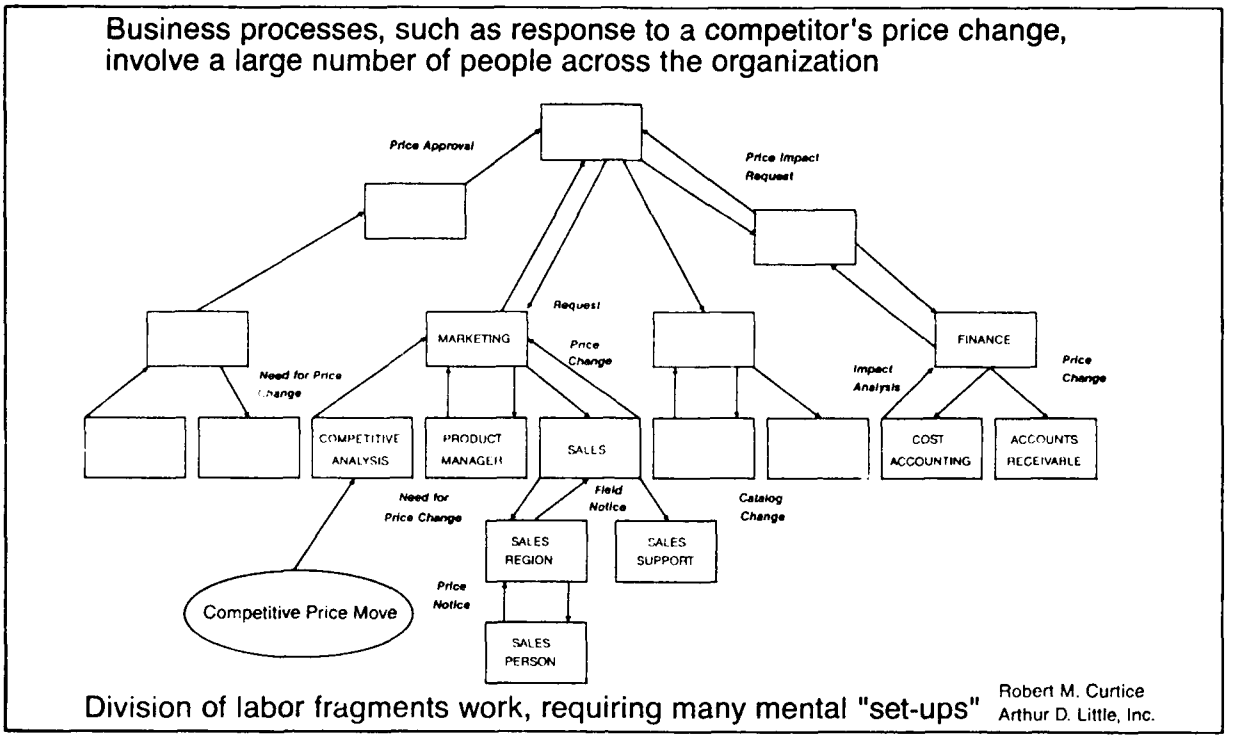

FIGURE 1. COMPETITIVE PRICE MOVE—INFORMATION FLOW[3]

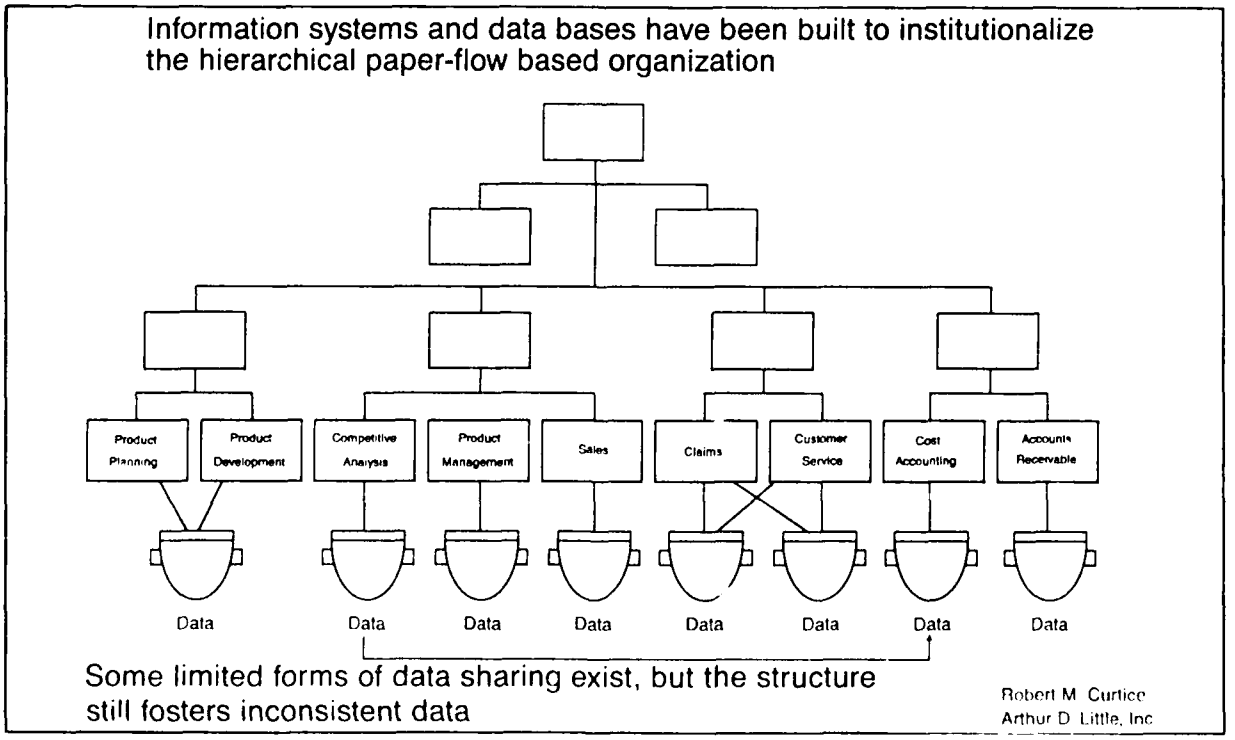

FIGURE 2. COMPETITIVE PRICE MOVE—MULTIPLE DATABASES[3]

involved in paper-intensive tasks to a mere 100 professionals who will negotiate contracts and establish systems. One of the company's purchasing executives stated: *80 percent of our transactions could be ordered directly through the requisition system on terminals and bank-to-bank fund transfer.*[4]

Traditionally, companies have a pyramid management structure that contains many layers of managers. Many companies are eliminating the layers that (1) serve only as conduits by which information is transmitted up/down in the organization and (2) cause significant delay and inefficiency in the organization. In Japan, it is not unusual for a manager to have a span of control of about 500 people. However, moving to this flattened pyramid requires an information-rich environment in which information is rapidly available; such an organizational environment can only be enabled by IT.

NAVSWC SITUATION

NAVSWC has many of the same problems and opportunities as private industry. Until recently, the Center's funding and personnel budgets have been sufficient—cost-cutting was not a concern. *Streamlining* and business management improvement were highly sensitive subjects because of the perceived threat to managers and employees. It was a common saying that *we have never seen one job cut because of automation.*

The days of prosperity, at least for the foreseeable future, are over. NAVSWC has the opportunity to do more value-added activities with its current staffing and funding and/or to actually reduce expenditure of dollars and jobs by streamlining and restructuring. TQM should begin to remove the cultural barriers to improvement initiatives that have existed in the past. The following are resources that can be used now or in the near future to support managers, Quality Management Boards (QMBs) and PATs as they begin the improvement initiative:

- The IRM Phase II Report (July 1986) developed by a Center-wide Functional Managers and User Team contains over 120 business process flow diagrams and associated problems/issue statements that could serve as a reference for newly formed PATs.

- The NICCS Information Architecture expected to be completed in April 1991 by a Center-wide Reference Team provides a corporate framework for performance improvement definition and planning.

- Business area analyses data and process modeling techniques are being learned and prototyped by E50 NICCS analysts. This future capability will be a resource to QMBs and PATs.

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[4]Kanter, R. M., *When Giants Learn to Dance*, Touchstone, Simon, and Schuster, Inc., 1990.

SECTION 4
TRANSFORMATION

The transformation from the current state to one of a Strategic Advantage will require major and fundamental change. Management experts suggest that to achieve a strategic advantage managers must change the way they conduct their business processes, structure their organizations, lead and empower their employees, satisfy their customers, and work with their suppliers.

SLOAN SCHOOL TRANSFORMATION MODEL

Recent management studies indicate that information technology is a principal enabler of this required and inevitable transformation. A transformation model[5] (Figure 3) indicates the levels that organizations must go through over the long term to achieve maximum benefit.

Levels I and II are considered *evolutionary* because they represent a gradual and relatively peaceful, social, political, and economical advance from a simpler to a more complex state. Levels III, IV, and V are *revolutionary* because they constitute or bring about a major and/or fundamental change. Even though these levels are revolutionary, they will require a long-term transformation process.

- **Level I**—*Localized Exploitation*, which is achieved by individual departments, principally uses information technology to improve operations. This level does not require interdepartmental interaction or approvals.

- **Level II**—*Internal Integration* is achieved when an organization establishes a strategic vision and basic capabilities for corporate integration (e.g., a corporate network backbone and limited office automation).

- **Level III**—*Business Process Redesign* is achieved by organizations that implement a TQM approach enabled by IT to streamline business processes across the corporation.

- **Level IV**—*Business Network Redesign* uses TQM enabled by IT (networks, databases, and expert systems) to integrate business processes, share data, create alliances with customer and supplier, and share knowledge.

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[5]Venkatraman, N., Sloan School, MIT, DAMA Symposium, 7 May 1990.

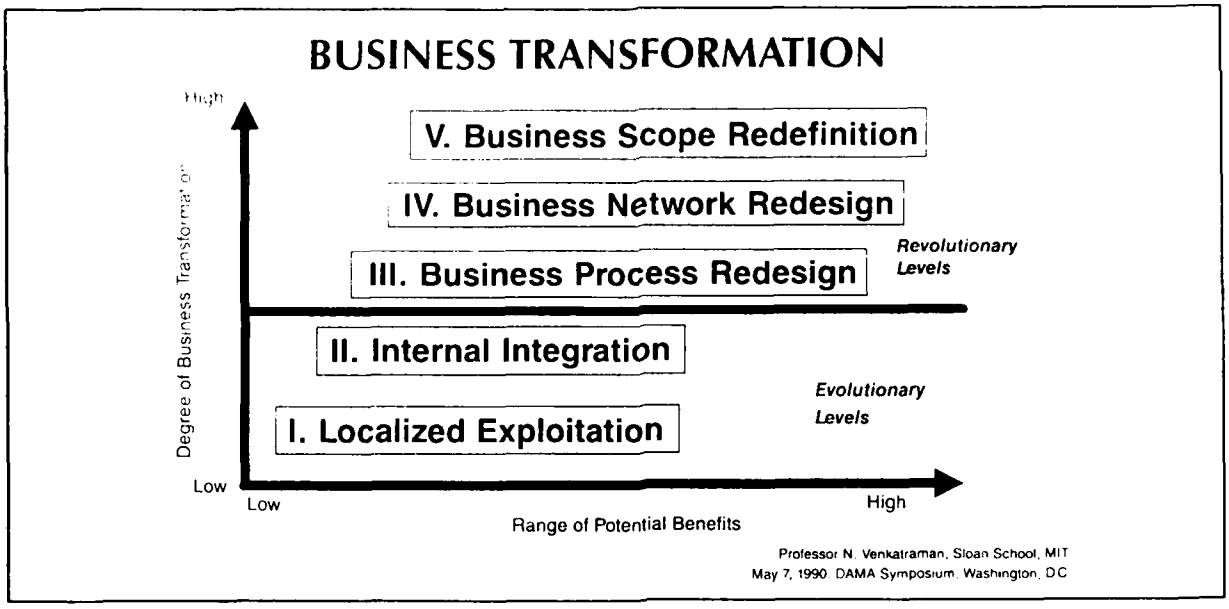

FIGURE 3. FIVE LEVELS OF IT-ENABLED BUSINESS TRANSFORMATION MODEL[5]

- **Level V**—*Business Scope Redefinition* requires enlarging and/or changing the business scope. It almost always requires a major organizational transformation.

NAVSWC TRANSFORMATION POSITION

Most private industry organizations have achieved transformation somewhere between Levels II and III. NAVSWC has achieved Level II and is starting Level III because

- The Center has the infrastructure components that include limited automated processes and information systems, a Center-wide network, and a central information systems organization (E40/E50).
- A first iteration strategic vision has been developed in the *Plan for Quality Management at NAVSWC*,[6] the *Strategic Plan for Managing Business Information*,[7] and the *NSWC Information Command and Control System (NICCS) Master Plan*.[8]
- TQM has been introduced and accepted by Center management.

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[6]Commander and Technical Director (C&D), *Plan for Quality Management*, Draft, Naval Surface Warfare Center, Dahlgren, VA, 1990.

[7]Gardiner, David C., *Naval Surface Warfare Center: Strategic Plan for Managing Business Information*, NSWC TN 89-395, Dahlgren, VA, November 1989.

[8]Wilson, Carol B., *NSWC Information Command and Control System (NICCS) Master Plan*, NSWC TN 89-425, Dahlgren, VA, December 1989.

A corporate implementation of TQM will move NAVSWC up through Levels III and IV of the transformation model. The timeliness of the transformation and the quality of the results will depend on our success in implementing our NICCS plans. We must be innovative and aggressive in fending off attempts by DOD and Navy to cut or delay our information technology initiatives. The following sections will address how information technology will enable NAVSWC to successfully implement TQM. Having achieved Levels III and IV, Center managers and employees will have the information and the support systems to make Level V-type decisions with confidence.

SECTION 5
TQM ENABLED BY IT

TQM

NAVSWC's senior management has accepted the TQM philosophy to continually improve and meet the challenge of the future. Since most managers have received TQM awareness training, only a summary of the TQM approach will be presented in this section to show how IT supports its implementation.

TQM is a HOLISTIC MANAGEMENT APPROACH because it

- **Considers the total system** (i.e., all management processes and their interfaces)—The total *system* concept is one in which all of the components within a system and the people that work in it must work toward the aim of the organization. The total system is the Center. A well-intended departmental TQM effort may improve the process in that department, but possibly at the expense of other departments and the Center. A *systems engineering* approach to the Center's TQM implementation will provide benefits to each department and collectively to the Center as a corporate unit because everyone will be following a strategic vision, corporate direction, and framework. The systems engineering approach selected for the data-intensive business processes and information systems is Information Engineering.

- **Employs a complete set of hard (engineering) and soft (personnel) management sciences**—TQM employs *hard* sciences in the form of rigorous systems engineering techniques (e.g., strategic planning, an architectural framework, scientific problem-solving, requirements analysis, measurement, and prototyping). *Soft* sciences are used to obtain the very best from each and every manager and employee by giving them the respect, power, guidance, and techniques needed to contribute. Leadership behavior must be *fine-tuned* to energize each unique individual to think and work toward his or her potential. Team efforts should be expected to produce results that are greater than the sum of the individual parts.

- **Involves and benefits managers, employees, customers, and suppliers.**

IT SUPPORT TO TQM

IT breakthroughs over the past decade are just now beginning to provide practical solutions to business problems. IT development methodologies have adopted the systems engineering approach and are now supported by automated tools. These methodologies provide support for assessing areas for improvement, for defining the *system* (the Center) and its components, and for providing techniques for developing improvement solutions. IT provides the computer and network systems to aid planning, support decision-making, and measure and communicate progress.

Corporate Systems Framework—Information Strategy Plan

One IT product that will enable TQM at NAVSWC is the Information Strategy Plan (ISP) that is being developed by a Center team (called the Reference Team) of functional business managers from each support department, administrative officers, and line and program managers from the technical departments. This team is supported by E50 under the NICCS Program. The ISP, which is the first step in a top-down Information Engineering methodology, provides at least one aspect of corporate guidance that should result in total *system* optimization. The ISP provides two components that will assist managers, QMBs, and PATs improve their business processes:

- *Information Architecture*—Consists of models that depict the data and functions that are needed to conduct Center business. The Reference Team created a corporate view of how things *should be* as opposed to current operations. Managers and PATs can use this *should be* architecture to identify opportunities for reducing redundant and ineffective work processes and inconsistent data.

- *Prioritized Systems Plan*—Identify the right things to do consistent with Center priorities. Center management can use this plan to select improvement initiatives.

Process Improvement—Modeling and Reengineering

In a TQM environment, formal PATs as well as managers and employees in their daily work will be focusing more attention to process improvement. For many of them, they will be faced with the unfamiliar challenges of designing new processes and/or redesigning existing processes. The Information Architecture described above will assist them in planning and organizing their efforts in a *systems* context; this will prevent the design of a process that does not support other Center processes. The actual design of processes will require much more rigor and in-depth analysis.

The Information Engineering methodology provides data and process modeling and reengineering techniques that are needed to produce well-engineered processes.

The transition from principally individual departmental processes to more corporate *systems* will increase the complexity of our future improvement efforts. Design of shared data and processes will require standard modeling techniques, automated tools [e.g., Computer-Assisted Software Engineering (CASE)], and a corporate repository of consistent data and procedures. E50 has developed a small core capability to support the design of corporate processes and information systems. A Center-wide TQM implementation will require a greater level of support than currently exists in E50, be it in the form of direct support or training others.

Empowerment and Leadership—Measurement and Information Systems

Other areas where IT enables TQM are Empowerment and Leadership. Managers, employees, and teams will require varying degrees of automated support to collect data, measure performance, make decisions, and communicate results. TQM will force information down to the people on the line as well as up to senior management: information must be consistent and accurate to be shared; information systems must be able to both summarize and provide detail; and metric and decision support systems will be increasingly required as the TQM implementation progresses. Plans to provide this IT support must be expedited. Temptations to cut IT ACP and overhead resources in response to external constraints should be resisted and worked around if cuts are firm.

TQM IT Infrastructure

Figure 4 shows how IT supports the TQM infrastructure. Please note the two-way links between the Center Information Architecture and the PATs, which indicates that **the Architecture provides initial guidance to the QMBs and PATs and that, as TQM progresses, the PATs experience will update the architecture.**

TQM IT RELATIONSHIPS SUMMARY

Figure 5 summarizes the TQM IT relationships: the two-way directional arrows indicate the complimentary relationships; the single directional arrows show the techniques and systems that could be a part of the TQM tool set.

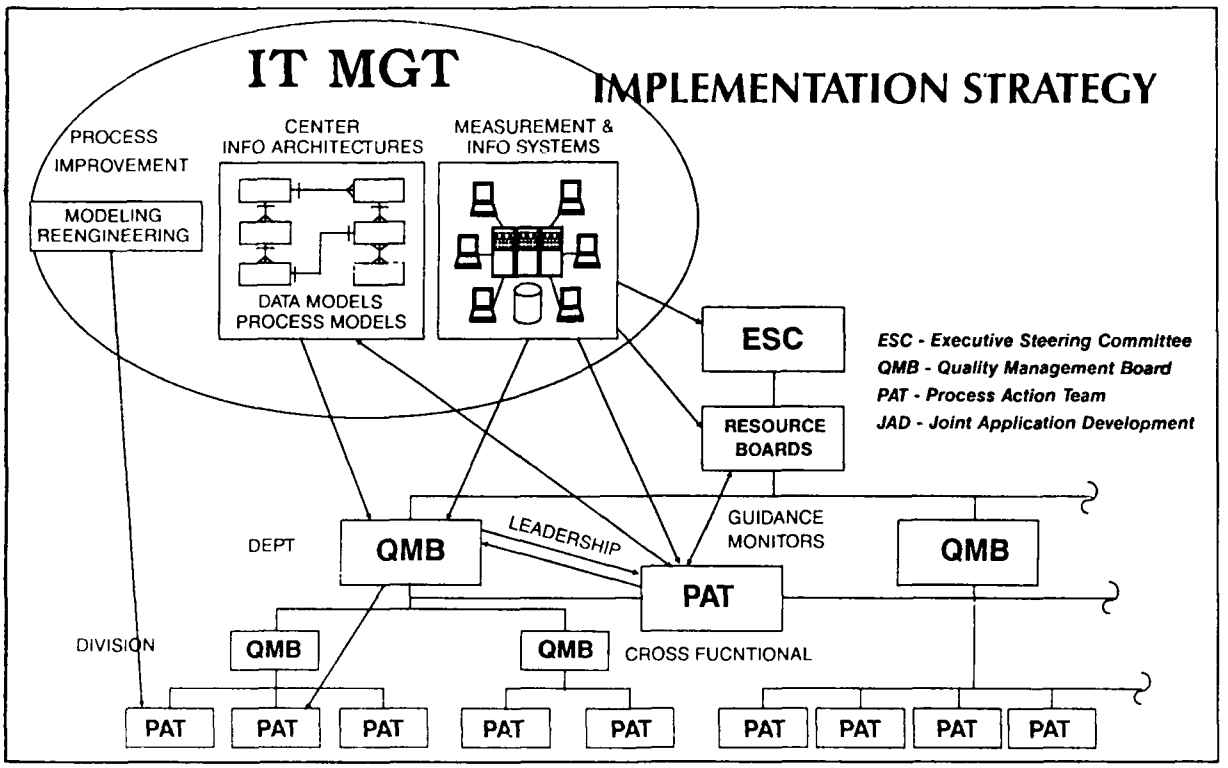

FIGURE 4. TQM IT IMPLEMENTATION STRATEGY MODEL

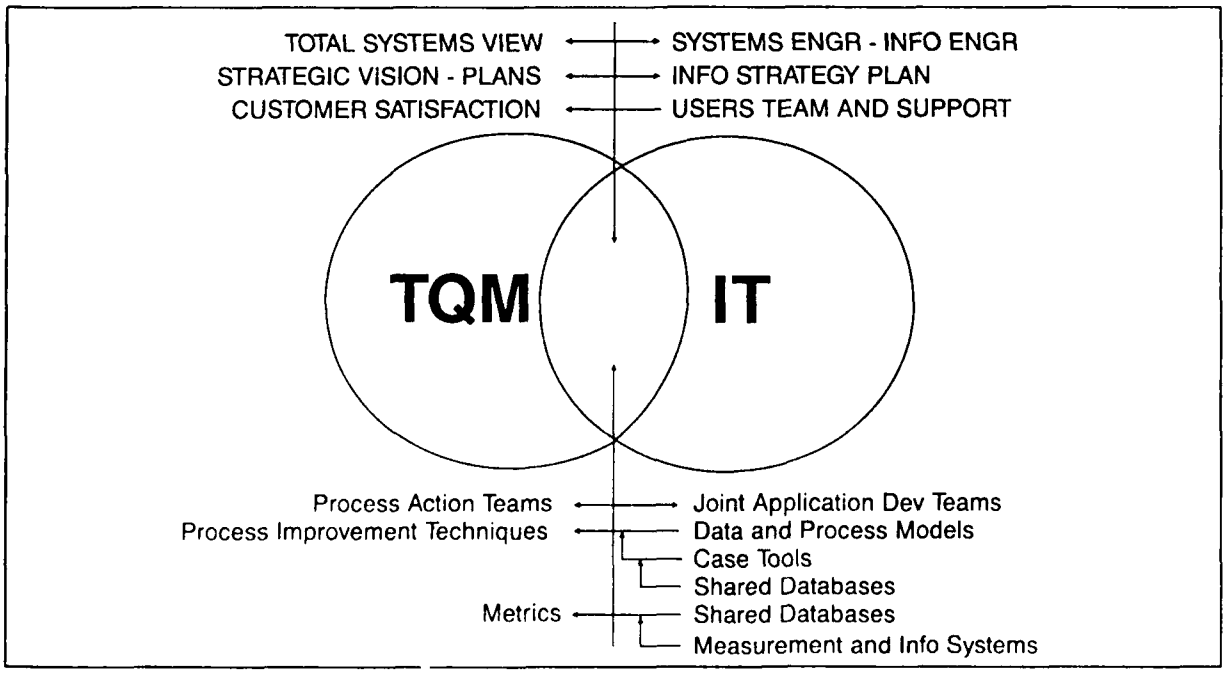

FIGURE 5. TQM IT: SUPPORTING COMPLIMENTARY ASPECTS MODEL

SECTION 6
STRATEGIC MANAGEMENT--A CORPORATE TQM APPROACH

As in most management approaches, planning and measurement are essential elements of TQM. As expressed by Sink,[1] *We firmly believe that unless your organization successfully establishes strategically driven planning for performance and measurement systems, none of the other interventions (SPC, automation, gainsharing, etc.) will be effective.* Sink further addresses the important linkage between Business Planning and Performance Planning when he writes: *The business strategy is given life and meaning by a performance improvement plan/strategy that facilitates attainment of its business strategy. It links strategy to action.* More succinctly stated by Bob Ryland, Engineering and Information Systems Department (E), *Business Planning is the what, Performance Planning is the how.*

STRATEGIC MANAGEMENT MODEL

A Strategic Management Model (Figure 6) suggests concepts for senior management, Center Planning Staff (D21), Resource Enhancement and Controls Office (D27), and others to consider in developing a corporate TQM approach. The Business Planning aspects of the model were taken from the D21 strategic planning presentation given at the Fall 1990 Board of Directors (BOD) Workshop and are consistent with emerging trends in industry. The Performance Planning Model and concepts resulted from my personal research, experience, and ideas.

General Considerations

The Strategic Management Model is based on the following considerations:

- Strategic Management Model is a top-down, closed-loop process. Strategic Planning drives Tactical Planning. Tactical Planning identifies resources and initiates Operations. Operations performance should be measured and fed back to update Strategic and Tactical Planning.

- Performance Planning should be linked to and performed in the Business Planning cycle. Business Planning should feed Performance Planning with mission objectives.

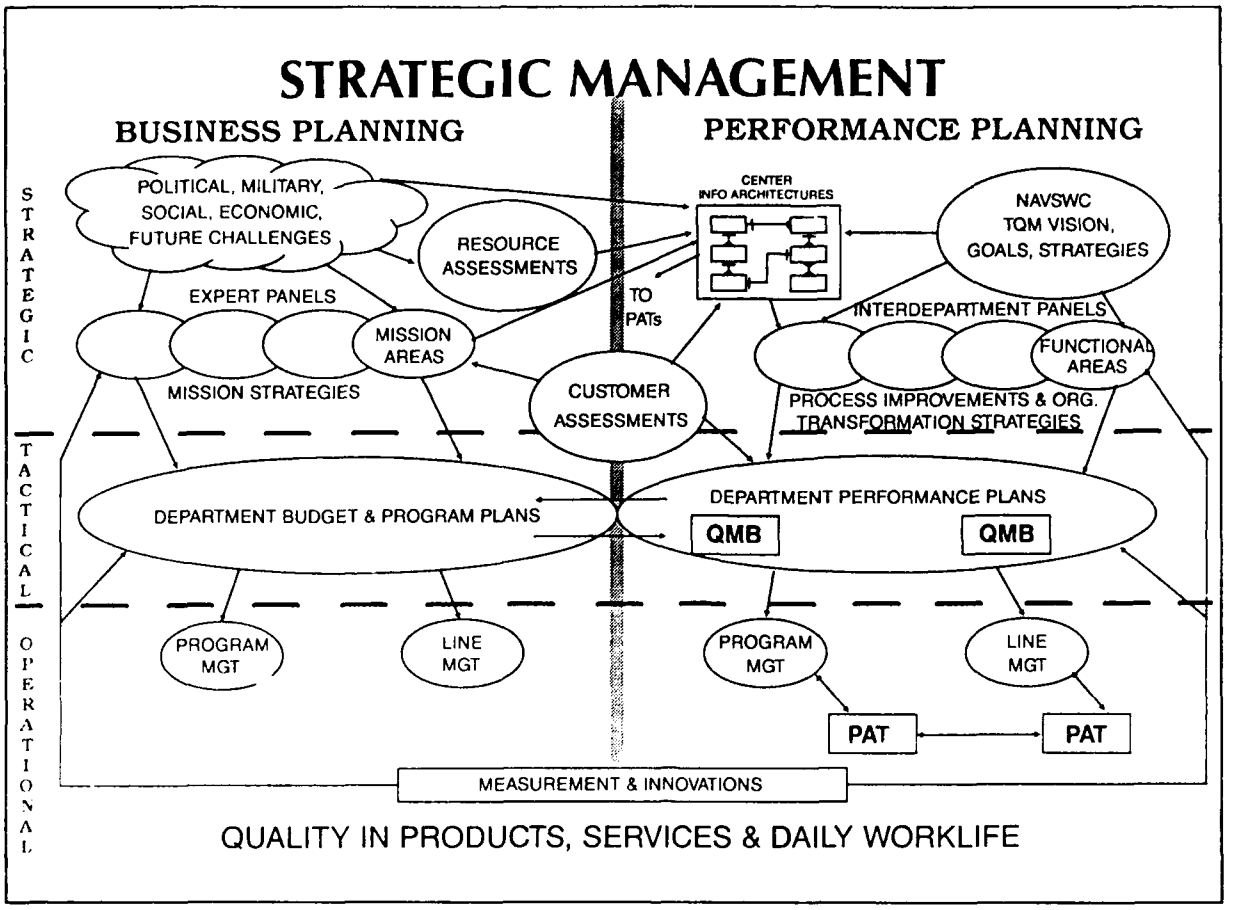

FIGURE 6. STRATEGIC MANAGEMENT MODEL

- Planning should follow a structured process but be less bureaucratic and burdensome (i.e., less formal documentation, details, and time consuming).

- All management levels should be involved in planning but at varying levels of intensity at the different steps in the process:

  - Strategic Planning done for key selected corporate mission and functional areas by interdepartmental panels vs total departmental involvement (departmental strategic planning tends to result in strategies that justify current departmental numbers).

  - Department managers develop tactical and operational plans and budgets following strategic directions.

  - Develop ways of encouraging input from all employees without creating an administrative burden.

Business Planning

The Business Planning portion of the model will be briefly described, since it has already been presented to Center management by D21. Inputs to Strategic Business Planning follow:

- Future Political, Military, Social, and Economic Scenarios
- Prediction of Future Resource Constraints and Availability by the Center's Functional Managers (i.e., Comptroller, Personnel, etc.)
- Customer and Sponsor Needs and Assessments

From these inputs, senior management selects key mission areas; (e.g., ordnance systems) for which strategies will be developed by a panel of interdepartmental experts. The departments then translate this strategic guidance into budgets and program plans that, when corporately approved and funded, initiate work. Planning and measurement systems should be put into place to support this closed-loop process.

Performance Planning

The objective of corporate Performance Planning is to select and guide improvement efforts in those areas that support mission objectives. Corporate Performance Planning should optimize the "system" (i.e., the Center) whereby duplicative and possibly conflicting improvement efforts by different departments are minimized.

The *Plan for Quality Management at NAVSWC*[6] is an excellent corporate strategic document to start the journey toward continual improvement. It clearly states (1) management's commitment to lead this management process, (2) what we are attempting to achieve, and (3) a conceptual framework to get started.

The Performance Planning side of the Strategic Management Model begins with this corporate guidance and the mission objectives developed in Strategic Business Planning. As in Business Planning, senior management should select key functional areas in which to concentrate its improvement efforts. The Information Architecture, which will aid management when selecting these key areas, defines the major functional areas and the relationships between subfunctions. The Center Reference Team that developed this architecture also prioritized the areas that need improvement. Management (i.e., the Executive Board and the Resource Boards) can elect to accept the Team's priorities or choose different key areas based on their view of Center needs. The respective Resource Boards could be used to provide guidance and follow progress throughout the Strategic Management cycle.

Interdepartmental Panels would be formed to develop process improvement and organizational transformation objectives and strategies. The Panels would use the Information Architecture models and analysis to aid in their strategy development. The Panels could be further aided by more detailed process and data models that are produced in a later stage of the system engineering/information engineering life cycle; this stage, which will not be described in detail, is referred to as Business Area Analysis (BAA). For example, if Financial Management is selected as a key functional area, a BAA would define the information flow and the process relationships across the entire Center for the Financial Management function. This total systems view at the strategic planning phase will minimize later duplicative and conflicting efforts by departmental QMBs and PATs.

The Performance Planning cycle would proceed to the tactical level where QMBs would develop performance objectives and establish departmental or cross-functional PATs using the guidance from the strategic-level panels and from departmental-specific customer assessments.

Line and Program Managers and PATs would work together using TQM techniques to bring their processes into *control* and to begin their continual improvement efforts. Data and process modeling techniques should be used in many cases to support this effort. Managers and teams would use measurement and information systems to measure the process and progress and communicate results. Innovation would be fed back to management to update the planning process and to extend recognition to individual and team members.

The above efforts suggest an essential supporting role for the E50 NICCS Program. The Information Architecture is nearly complete in its second iteration. The IRM Phase II Report of July 1986, which contains process diagrams of most major business areas as they existed then, is a good benchmark for PATs' improvement efforts. Data and process model efforts at the BAA level are only in the planning and/or pilot stages. From this juncture, it is important for the Center to have a corporate approach and plans based on mission priorities.

SECTION 7
SUMMARY

TQM is a management philosophy and approach that brings together a complete set of management principles and techniques for an organization to survive and grow in the 1990s. An attempt has been made in this report to show how TQM is supported by and, in certain ways, is dependent on the effective management of IT. The Information Architecture, contained in the ISP being developed by E50 and a Center Reference Team, will provide a framework for a corporate TQM approach. This framework is very important to prevent costly false starts (i.e., initially working on the wrong things and developing improvement results that do not work together as a system). The Information Architecture, the advanced Information Technology modeling techniques, the Strategic Management Model, and the other management concepts and techniques (Appendix) are offered as input to those developing a NAVSWC corporate TQM approach.

STRATEGIC ADVANTAGE SUCCESS FORMULA

NAVSWC, which has just begun the TQM journey, saw the importance of managing its information resources and established a Center-wide information system organization in E Department. The Center can continue to improve on its reputation of excellence and achieve a Strategic Advantage by building on the success formula it has put into motion (Figure 7).

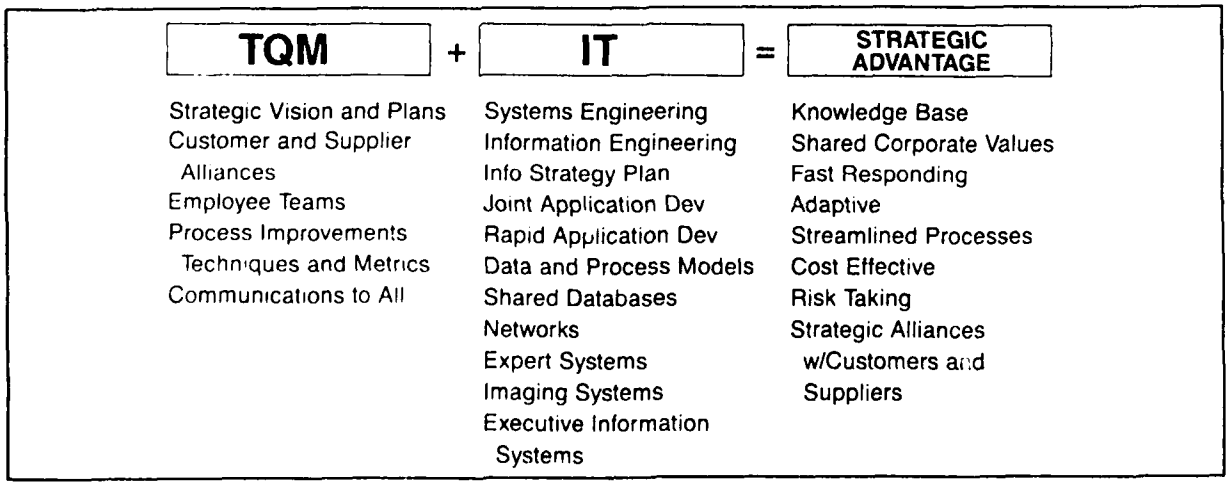

FIGURE 7. STRATEGIC ADVANTAGE SUCCESS FORMULA

APPENDIX

OTHER ORGANIZATIONAL TRANSFORMATION AND PROCESS IMPROVEMENT CONCEPTS

Other concepts that support TQM are presented. Some of these might be considered as intellectual management concepts that are visionary in scope and are not achievable in the short term, others are more pragmatic that could be used today by managers and PATs to initiate the improvement process.

VISIONARY MANAGEMENT CONCEPTS

The visionary concepts are provided as a strategic framework (i.e., what we want NAVSWC to look like in 10 to 20 yr and what steps we take now to move toward our vision).

Managing Organizational Interdependence

This concept comes from research studies by MIT Sloan School of Management[A-1] (Rockart and Short, MIT, 1989). It addresses the increased need for organizations to work together as a system and the role of Information Technology in meeting their needs.

By effective management of interdependence, we mean a firm's ability to achieve concurrence of effort along multiple dimensions of the organization.

> *ITs most important role is allowing firms to manage organizational interdependence...improved communications capability and data accessibility will lead to systems integration within business. Unlike in previous eras, managerial strategies based on optimizing operations within functional departments product lines, or geographical organizations simply will not be adequate in the future.*
>
> *This* (i.e., management of interdependence), *in turn, will lead to vastly improved groups communications and, more important, the integration of business processes across traditional functional, product, or geographic lines.*

A-1 Rockart, J. F. and J. E. Short, *IT in the 1990s: Managing Organizational Interdependence,* Sloan Management Review, MIT Sloan School of Management, Winter 1989.

A cross-functional team approach to implementing TQM supported by the following IT services will move an organization toward interdependence: Center information architecture, accessible shared databases, and communication links to all employees.

The Coming of the New Organization

Peter Drucker forecasts that organizations of the future will be information-based. This future state will allow decisions to be made where the work is performed by teams of well-informed specialists. These teams will be guided by clearly communicated corporate goals and expectations from senior management. The guidance from the top and the execution by the workers will eliminate management layers in between. Our cultural paradigms that emphasize individual accomplishments and functional separations will take time to evolve to a new state. The following concepts are presented as *food-for-thought* in planning for our long TQM journey:[A-2]

> *The typical large business 20 years hence will have fewer than half the levels of management of its counterpart today, and no more than a third the managers.*
>
> *The typical business will be knowledge-based, an organization composed largely of specialists who direct and discipline their own performance through organized feedback from colleagues, customers, and headquarters. For this reason, it will be what I call an information-based organization.*
>
> *The second area that is affected when a company focuses its data processing capacity on producing information is its organization structure. Almost immediately, it becomes clear that both the number of management levels and the number of managers can be sharply cut. The reason is straightforward: It turns out that whole layers of management neither make decisions nor lead. Instead, their main, if not their only, function is to serve as "relays"--human boosters for the faint, unfocused signals that pass for communication in the traditional pre-information organization.*

[A-2] Drucker, P. F., *The Coming of the New Organization*, Harvard Business Review, January/February 1988.

In the information-based organization, the knowledge will be primarily at the bottom, in the minds of the specialists who do different work and direct themselves. So today's typical organization in which knowledge tends to be concentrated in service staffs, perched rather insecurely between top management and the operating people, will likely be labeled a phase, an attempt to infuse knowledge from the top rather than obtain information from below.

Traditional departments will serve as guardians of standards, as centers for training and the assignment of specialists; they won't be where the work gets done. That will happen largely in task-focused teams.

Traditional sequence of research, development, manufacturing, and marketing is being replaced by synchrony: Specialists from all these functions work together as a team, from the inception of research to a product's establishment in the market.

So an information-based business must be structured around goals that clearly state management's performance expectations for the enterprise and for each part and specialist and around organized feedback that compares results with these performance expectation so that every member can exercise self-control.

PRAGMATIC CONCEPTS AND TECHNIQUES

The pragmatic concepts and techniques that follow can be introduced to and/or, in some cases, used immediately by managers, information systems developers, and PATs today.

Subject Database Environment

Data must become accessible to managers and employees alike before an organization can become a *New Organization* as described by Peter Drucker.[A-2] Leadership, empowerment of employee teams, integration and streamlining of business processes, reduction in organizational layers, responsive customer service, etc. are dependent on immediate access to accurate and consistent data. In most organizations today, data are contained in numerous databases maintained by different functional and program organizations. The data contained in these separate databases are normally out-of-sync time-wise and have conflicting names and values. It is also difficult for someone not immediately responsible for that database to gain access.

The solution to this data problem is more of a cultural challenge than a technical one. Relational database technology and *user-friendly* query languages now exist to build accessible databases (it should be noted that enterprise-wide shared databases are a real technical challenge).

The cultural challenge is to change the *Application Database Paradigm* that I describe as follows:

> *Systems developers and users have "always" built systems and databases to satisfy specific applications (e.g., to automate a business process and/or produce a report). These application databases contain all the data needed by the specific process or report. For example, a Prompt Pay Database would contain data about contracts, procurements, financials, personnel, organizations, shipments, etc. Much of this same data could already exist in other databases or files but it would probably be named differently, be out-of-sync some way, and would require redundant processing.*

The solution to these problems and inefficiencies is to change the Application Database Paradigm to a Subject Database Environment. In this new environment, separate physical databases would exist for *subject* areas (e.g., one database would contain all personnel data, another all financial, another all contracts, etc. within reason, of course). As in the above example, a Prompt Pay application would receive its data from several subject databases that could be maintained by functional departments. Parts of the Prompt Pay process might even be better performed in a different department (a hypothetical example). In addition to subject databases, corporate databases will be required for executive information, planning, data mangement, etc.

Changing to a Subject Database environment is a cultural challenge because it not only requires changes to the way we have developed systems in the past but, more traumatically, it threatens an organization's power of process and data ownership. This change will require a long-term, Center-wide incremental approach that will include

- Awareness of the Benefits of Subject Databases Vs Application Databases
- Information Architecture and Prioritized Systems Plan
- Data Standards
- Data Management
- Relational Database Techniques and Tools

Process Normalization

Process Normalization is *an approach for designing the minimum number of processes required to support business functions, based upon an understanding of the data.*[A-3] Process Normalization techniques should be used by PATs for improving business processes and by systems developers for streamlining both the business process they automate and the systems development process itself.

Benefits derived from Process Normalization are

- Fewer processes enhance responsiveness to customers.
- Systems development manpower and costs are reduced because there are fewer processes to automate and maintain.
- Few processes result in reduced operational manpower and simplified organizational structure.

Process Normalization will result from many of the data techniques discussed herein; however, there are two techniques that deserve further emphasis:

- *Create Data (and delete it) by a Primitive Process*—That is, enter data into the system **one time, at the source**. Eliminate all other data entry and deletion processes.
- *Separate Transactional Processes from Decision Support Processes*—Transaction processing deals principally with primitive data. Decision support processing deals with derived data (manipulated, summarized, or extended data) from more than one transactional process. When attempting to automate a decision support process in a transactional processing system, bridges normally must be built between different systems, which thereby adds complexity. Decision support processes can frequently be satisfied with a standard generic software application or query tool and can directly access subject databases. This reduces systems development workload by using *reusable code.*

[A-3] American Management Systems, Inc., *Process Normalization Presentation*, DAMA Meeting, October 1990.

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1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
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4. TITLE AND SUBTITLE
STRATEGIC ADVANTAGE IN THE 1990s: TOTAL QUALITY MANAGEMENT ENABLED BY INFORMATION TECHNOLOGY

5. FUNDING NUMBERS

6. AUTHOR(S)
David C. Gardiner

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Surface Warfare Center (E04)
Dahlgren, VA 22448-5000

8. PERFORMING ORGANIZATION REPORT NUMBER
NAVSWC TR 91-13

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

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This document provides information to support the Naval Surface Warfare Center's (NAVSWC's) Total Quality Management (TQM) implementation. The main objective is to show that Information Technology (IT) is an essential enabler to TQM. TQM will enable the Center to continually improve on its reputation of excellence and will prepare us to respond to the inevitable changing roles in the Department of Defense (DOD).

14. SUBJECT TERMS
Total Quality Management (TQM)
Information Technology (IT)

15. NUMBER OF PAGES
37

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
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